DOCKET FILE COPY ORIGINAL

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

RECEIVED
JUL 12 1996
Federal Communications Commission
Office of Secretary

In the Matter of	)	
	)	
Advanced Television Systems	)	
and Their Impact Upon the	)	MM Docket No. 87-268
Existing Television Broadcast	)	
Service	)	

FCC 96-207 – FIFTH FURTHER NOTICE OF PROPOSED RULE MAKING

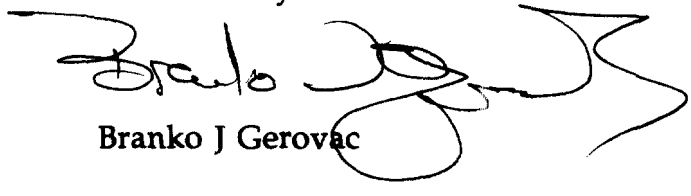
COMMENTS OF

Branko J Gerovac
MIT/RPCP
1 Amherst Street (E40-218)
Cambridge MA 02139

July 10 1996

I file these comments on July 10 1996, in the FCC's Fifth Further Notice of Proposed Rule Making in the Matter of Advanced Television Systems, MM Docket No. 87-268. These comments are mine only and do not necessarily represent others at my organization.

Submitted by:



Branko J Gerovac

No. of Copies rec'd 0+3
List ABCDE

One Amherst Street, E40-218, Cambridge Massachusetts 02139
Phone: 617-253-4138 • Fax: 617-253-7326 • email: bjg@rpcp.mit.edu

The FCC faces a difficult decision in the current FNPRM.

On one hand, you chartered the formation of the Advisory Committee on Advanced Television Systems (ACATS) almost 9 years ago with the expressed purpose of investigating the next generation advanced television system. After first a competitive and then a collaborative process, in which I participated, ACATS/ATSC delivered a technical specification based on the work of the Grand Alliance, as detailed in the 96-207 FNPRM and 250+ pages ATSC technical specifications.

On the other hand, substantive debate on the details of the proposal remains unresolved. The debate is not frivolous. Experienced researchers, engineers, and users across industries have serious doubts on the efficacy and adequacy of the current proposal. Several issues have gone unresolved for quite some time: progressive scan, square pixels, interoperability, extensibility, scalability, SDTV in the context of HDTV, selectable format parameters (e.g., resolution, aspect ratio, compression scheme, etc.), modularity, error protection, communication architecture, RF architecture, etc.

The debate arises in part from the disagreement on the fundamental requirement for ATV. Is it just a television service? Does it have broader implication to other industries? To what extent do the broader implications place requirements back onto the ATV design?

In my testimony (see attachment) on June 24 1993 to the House Committee on Science, Space, and Technology, during the Hearing on High Definition Information Systems, I placed highest importance on the implications of the emerging information infrastructure to the interoperability of ATV. Note that at that time, the Grand Alliance had just one month earlier announced its formation. Also note that the first World Wide Web browser (NCSA Mosaic, alpha release) would not be available for another three months.

All of the massive growth that we have seen in the Internet and the World Wide Web occurred after the key specifications of the Grand Alliance proposal had already been established. We are experiencing a rapid change and realignment of communication and the interest and importance of the content of the communication. And of course, technology continues to advance at ever increasing rates.

The dilemma before the FCC is that the current ATV proposal falls short of meeting the needs of a long lived, cost effective, nationally beneficial digital television system. Though it may be tempting to just go along with the ACATS/ATSC proposal, simply doing so in the context of the ongoing debate undermines the value of investment and deployment costs.

I urge the FCC not to blindly adopt the current proposal, but instead to look into the reasoning of the debate and to facilitate addressing the concerns of all effected industries and parties.

Statement of
Branko J. Gerovac
Research and Development, Advanced Technologies
Communications, Education, and Media Business Unit
Digital Equipment Corporation

Hearing on High Definition Information Systems

Committee on Science, Space, and Technology
U.S. House of Representatives

June 24 1993

I thank the chairman and the committee for the opportunity to discuss this important topic. And, I commend the committee's recognition of its implications.

The outcome of the FCC's process to define Advanced Television Service (ATV) has crucial implications to future technology innovation and commercial success across all industries and applications. A truly interoperable and extensible ATV system presents substantive economic and qualitative advantages in areas that are of critical importance to the future of the United States: education, health care and human services, commercial enterprise, competitiveness, productivity, and so on. Further, ATV is pivotal in defining our information infrastructure (as is recognized in the FCC's Advisory Committee's ATV System Recommendation, February 24 1993).

Insuring interoperability (of television, communications, and computing) and extensibility of services are the keys that unlock interactive information in all forms, easily conveyed, viewed, and manipulated across the variety of consumer and professional settings and applications. The combining motive power of demand in entertainment and industrial communication sectors will produce a revolution in personal growth and quality of life, and a dramatic enhancement of large and small business productivity and competitiveness and government effectiveness. All of this can be achieved while simultaneously reducing or eliminating the high cost of converting signals across disparate environments. In turn, advanced services, now available to a fortunate few, will be universally accessible to the larger public through this new information infrastructure.

ATV must be deployed expeditiously -- sooner rather than later. An interoperable ATV system will shorten deployment through a wider variety of uses. A non-interoperable ATV system would deny the full benefit and potential of ATV, and would be vulnerable to being supplanted by the interoperable industrial system that would necessarily emerge outside of the ATV arena. An interoperable and extensible ATV system will have more avenues for early application across industries that will more rapidly expand the availability of services, grow the demand, and reduce cost.

A valuable definition of interoperability is found in the FCC Advisory Committee report on interoperability (PS-WP/4 Final Report, December 11 1992). We endorse the findings of the report, and encourage that maximum weight be applied to the criteria of "Interoperability, Extensibility, and Scope of Features and Services" in deciding the direction for advanced television. Briefly, these criteria are: digital implementation, universal header/descriptor, progressive scan transmission format, packetized data structure, square pixels, dynamic reallocation of the data stream, recognition of international standards, and modular architecture.

The notion of a Grand Alliance is a major step forward. It moves the process from a competition to a collaboration, with significant ramifications to the system definition and decision processes. Though it is too early to tell one way or another, the Grand Alliance appears to adopt the interoperability criteria. Questions have been raised as to migration paths among other technical matters. The FCC Advisory Committee's Technical Subcommittee meets next week to review the current status of the proposal and to provide feedback and recommendations.

Certainly, several of the criteria seem to be well incorporated into the current proposal (e.g., digital implementation, packetized data structure, dynamic reallocation of the data stream). Detailed technical review may be needed to validate the areas, but there seems not to be a question of the value and importance of the features. (It is interesting to note that many of these features were considered to be impossible or unnecessary a short time ago.)

Progressive scan and square pixels are incorporated, but it is unclear to what extent. The key issue here for interoperability and the information infrastructure is what constitutes minimal compliance; the favored compromise position is progressive format in the transmission channel as noted in the FCC Advisory Committee reports. Continued reliance on interlace scan would greatly hinder interoperability and the capabilities of ATV and the information infrastructure.

Background

Convergence

Computing, communications, and media (including consumer electronics) are adopting a common set of base digital technologies. The common technology base and the economies of scale in the marketplace are driving the industries together. The result is much more than a simple technological leverage across industries, which was called the "technology food chain" (c.1988). Instead, there is an impending interplay and merger of the industries, products, and services themselves.

This **convergence** is now broadly accepted as inevitable. One needs only to look at recent issues of the Wall Street Journal, Fortune, Business Week, Newsweek, etc. to find articles providing views on the convergence and cross-industry developments. (The convergence theme is appearing in industries' conferences.)

A couple of years ago, the situation was often characterized as a **collision** among the industries. It was (and to some extent still is) uncertain how businesses adapt to and succeed in the convergence. Thus, convergence was often treated with apprehension due to the change that it brings to all the industries.

Though there is indeed collision with the convergence, it translates into **opportunity** for those that approach convergence as a new way of looking at their future activities.

The convergence will happen sooner or later. Events have shown that delaying tactics of an individual player or industry have only a temporary effect -- the technological and market drivers are too compelling. Further, recent events have shown that an individual player (or segment of players) can advance the convergence, and can advantageously position themselves.

Evolution

Convergence is not new. In many respects, it's been occurring quietly for many years. For example, seven years ago, the establishment of the MIT Media Lab (and similar efforts) brought attention and focus to convergence.

Throughout the 70s in the computing industry, there was a clear trend toward **decentralization** -- LSI, minicomputers, departmental computing, timesharing, etc. drove computer industry growth. The 70s also saw the beginning of technology migrating across industry boundaries -- e.g., TV display technology was used for computer

graphics displays and desktop video display terminals; consumer analog cartridge tape storage was adopted for data storage; dialup telephone modems were used for remote access; computers began being used in professional media production, e.g., video editing and newspaper copy writing; and semiconductors enabled pocket calculators.

In the 80s, industries began to show some interplay. The decentralization drive continued as both wide-area and local-area computer networking spread. Microprocessors gave birth to home video games. The cable TV industry with new content providers (e.g., HBO, CNN) mushroomed, and provided greater viewing choices for the individual. Cable TV provided another wire into the home, higher bandwidth than telephone, albeit still analog and one-way. CDs brought digital sound to the consumer, and totally replaced analog vinyl records. Interestingly, record companies readily embraced CDs, recognizing that they were in the music business, not the vinyl business.

Now in the **90s**, the convergence is apparent, and clearly enabled by the move to **digital signal processing and communications technologies**. The initial pivotal technology was/is ATV. In 1988, the news media focused attention on the potential importance of ATV to core technologies, the technology food chain, and industrial competitiveness. By the beginning of 1990, the full implications of the converging television, communications, and computing industries were promoted, and by the beginning of 1991, all U.S. ATV proponents were digital. Europe and the Pacific Rim are going digital as well. Digital TV (ATV and NTSC) is assured.

In past year, interactive TV and non-couch-potato interactive services are receiving greater recognition. Hence, the emerging pivotal driver is global, interactive, open access, interoperable communications infrastructure for voice, data, images, and video. Or in other words, an international information infrastructure.

It will be driven primarily by a new kind of **interoperability**. We're approaching a situation where the heterogeneity of content, services, and devices will go well beyond anything that was ever considered. Interoperability will be sought across all generation, transport, and delivery mechanisms, across industry operating styles, etc.

FCC ACATS PS/WP4 Interoperability Review Report

The Interoperability Review findings point out the critical factors and features that are necessary to achieve the full benefits of ATV. All proponent systems incorporate some measure of interoperability. We endorse the Conclusions and Recommendations from the Interoperability Review, and encourage the full suite of recommendations so that the full benefits of ATV are achieved for broadcast and non-broadcast uses. Reinforcing the recommendations:

Digital Implementation -- While digital format is absolutely necessary, simply being digital without providing the other factors is insufficient.

Universal Header/Descriptor (Ref. SMPTE standards effort) -- Given the variety of uses and content and given the rapid development of technology, a universally self-identifying data stream is mandatory to achieve extensibility and longevity of the standard.

Progressive Scan Transmission Format -- The traditional television industry represents the only significant use of interlace scan -- for historic technical reasons. An interoperable long-lived standard at a minimum requires the transmission signal to be progressive scan -- regardless of whether in the short term the two extreme ends of the delivery chain (cameras and displays) remain interlace with de-interlacing occurring in or near the camera before transmission and with scan reduction occurring at the display.

Packetized Data Structure -- Digital communications long ago recognized the benefits of packetized data structures and layered communications protocols for managing the complexity of communications. Digital television will be transported through and among a variety of media -- terrestrial broadcast, cable, satellite, telecommunication networks, computer networks, and packaged media. To expedite development efforts, to reduce product costs, and to extend features, packetization has proven successful.

Square Pixels (Square Sampling Grid) -- The television industry represents the only significant use of non-square pixels. (The first CRT displays used in the computer industry often used non-square pixels and interlace scan. It was quickly realized that this was not acceptable for ergonomic, picture quality, and computational needs across the variety of uses of picture material.) Square pixels are critical to sharing picture information across industries and uses.

Dynamic Reallocation of the Digital Data Stream -- The full power and potential of a digital data stream comes from the realization

that "bits are bits" and that digital data can represent any desired information -- whether moving or still pictures, sound, text, subscriber addresses, ordering and billing, control signals, and so forth without end. Being able to reallocate the data stream to different uses opens up a wide variety of applications, including within terrestrial broadcast.

Recognition of International Standards -- All industries are moving toward open systems as defined by formal standards. Regardless of whether the origins of a standard are de facto, developed in committee, or mandated, the primary requirement is to avoid establishing arbitrarily non-compliant system features when an existing or emerging standard is available or can be influenced that largely addresses the needs. (For example, ISO is nearing closure on MPEG2, which is largely similar to the ATV proponents' compression/decompression techniques. An international standard would obstruct anti-competitive efforts to partition world markets.)

Modular Architecture and Cost Effective Range of Implementation -- There will be a wide range of devices from very low cost to highly advanced. They will vary across many features -- e.g., black & white or color, small to large display, pocket sized to wall mounted, intelligent and interactive. The inexorable advances of VLSI technology, digital signal processing and communication, display technology, etc. will rapidly bring new features and capabilities. The ATV decision needs to endure for several decades in this context of inevitable and continual advances.

****